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October 22, 1993

By Federal Express

Ms. Rebecca Frey
Mr. David P. Seely
Remedial Response Branch (HSRL-6J)
U.S. EPA, Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: West Chicago Superfund Sites

Dear Rebecca and David:

I am writing on behalf of Kerr-McGee Chemical Corporation ("Kerr-McGee") concerning the radium-in-soil standard that Region 5 is contemplating for the West Chicago Superfund Sites. As you know, Kerr-McGee has submitted extensive comments concerning the proposed cleanup standard. Comments of Kerr-McGee Chemical Corporation on the Action Criteria for Superfund Removal Actions, West Chicago, Illinois, 23-31, 54-61 (Mar. 29, 1993) (hereinafter "Kerr-McGee Comments"). Among other points, we urged EPA to apply a radium-in-soil standard that is drawn from EPA's own regulations for mill tailings -- namely, 15 pCi/g above background for buried materials. 40 C.F.R. § 191.12(a). See also 10 C.F.R. part 40, appendix A, criterion 6 (counterpart NRC standard); 32 Ill. Admin Code. § 332.150(b)(1) (counterpart IDNS standard).

We understand that Region 5 is inclined to depart from the established regulatory standard and instead to adopt a 5 pCi/g standard for buried material. We also understand that this modification of the regulatory requirements is said to be justified by certain analyses conducted by EPA staff concerning the possible infiltration of radon into homes that might be built on contaminated materials. I have written one of you on June 18, 1993, to point out that the analyses on which the Region relies are largely inapplicable to West Chicago because they are premised on the assumption that the radium in the tailings is radium-226. The analyses are irrelevant to West Chicago because the tailings at issue

consist principally of thorium-chain material -- that is, they contain radium-228. See also Kerr-McGee Comments at 27-29.

Region 5 has not responded either to Kerr-McGee's comments or to my letters to indicate whether it has any disagreement with Kerr-McGee's submissions. I understand from a recent discussion with certain State officials, however, that the Kerr-McGee showings are being discounted on the basis that the West Chicago tailings contain some uranium-chain material -- that is, some radium-226 -- and that the analyses that are said to justify a 5 pCi/g limit are thus relevant. I am writing this letter to discuss the comparative levels of radium-226 and radium-228 in the West Chicago tailings and to describe a possible risk-based standard that reflects the actual ratios of radium isotopes in the West Chicago tailings.

EPA's contractors have previously recognized that the concentration of radium-228 in the West Chicago wastes is roughly ten times that of radium-226. See $CH_2M$-Hill, Remedial Investigation Report: Kerr-McGee Radiation Sites, West Chicago, Illinois, 4-39 (Sept. 29, 1986); S. Cohen & Associates, Inc., et al., Focused Risk Assessment for West Chicago Vicinity Properties, 2-3 (Jan. 1993). These estimates are fully consistent with the radiological data for the wastes that remain at the West Chicago Facility, the presumed source of the tailings at the Superfund Sites. See NRC, Supplement to the Final Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois, Table 2.4 (Apr. 1989) (NUREG-0904, Supp. No. 1) (enclosed). As the NRC data show, although there is some variability in the ratios of radium-226 to radium-228, the waste at the Facility for the most part contain significantly higher concentrations of radium-228 than radium-226. There thus should be no question about Kerr-McGee's and the EPA contractors' assertion on this point.

It nonetheless is correct that there is some radium-226 that is likely to be found in the off-site wastes, a fact that apparently underlies the Region's inclination to adopt a 5 pCi/g limit. It is also clear, however, that any risk-based adjustment of the regulatory requirements should not be based on the incorrect assumption that the only radium isotope in the wastes is radium-226. Fortunately, EPA has an appropriate model for establishing a radium limit that reflects the differing risks of the various radium isotopes -- namely, the toxic equivalency approach that EPA and others have applied to dioxins and certain other chemicals. The same procedure could be applied here.

As you know, the radium-in-soil standard is based on the radon-daughter inhalation risks that might arise from the construction of a hypothetical home on radium-contaminated soil. See Kerr-McGee Comments at 27-29. The radon-inhalation risk from radium-226 is perhaps a factor of 90 to 150 times greater than that from radium-228. See id. at 28-29. In order to apply a risk-based radium standard, it is therefore appropriate to adjust radium-228 concentrations to "effective-radium-226 concentrations" by division of the measured radium-228 concentrations by an appropriate adjustment factor. Thus, for example, if the adjustment factor were conservatively set as a factor of 50, the effective radium-226 concentration would be determined by the following formula:

$$C^{eff}_{Ra\text{-}226} = C_{Ra\text{-}226} + \frac{C_{Ra\text{-}228}}{50}$$

*where* $C_{Ra\text{-}226}$ *and* $C_{Ra\text{-}228}$ *are the actual concentrations of Ra-226 and Ra-228, respectively, and* $C^{eff}_{Ra\text{-}226}$ *is the effective Ra-226 concentration*

In order to assure compliance with EPA's contemplated risk-based standard, the effective radium-226 concentration might be limited to 5 pCi/g above background.

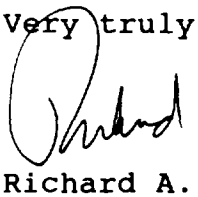
Kerr-McGee acknowledges that there is another limiting factor on radium concentration that must also be applied -- the current regulatory limit. Because the most stringent radium standard is found in the IDNS regulations, the total radium concentration for buried material must be less than 15 pCi/g above background. 32 Ill. Admin. Code § 332.150(b)(1). Thus, the more restrictive requirement -- either the risk-based limit of 5 pCi/g for the effective radium-226 concentration or the regulatory limit of 15 pCi/g requirement for total radium -- would govern the cleanup of buried materials.

We believe that such an approach to the radium standard is fully workable. As discussed in my letter of June 4, 1993, Kerr-McGee has equipment that allows that rapid measurement of radium-226 and radium-228 concentrations and has already offered to assist EPA in its application. The approach that we describe is thus both practical and scientifically valid.

I would appreciate it if you would place this letter and its enclosure in the docket that you are maintaining in

connection with the West Chicago Superfund Sites. Please contact me if you have any questions.

Very truly yours,



Richard A. Meserve

Enclosure

cc: Mr. David Ullrich
Mark Radell, Esq.

NUREG-0904
Supplement No. 1
Volume 1

# Supplement to the Final Environmental Statement

related to the decommissioning of the Rare Earths Facility, West Chicago, Illinois

Docket No. 40-2061
Kerr-McGee Chemical Corporation

Volume 1: Main Text and Appendices A-G

**U.S. Nuclear Regulatory Commission**

**Office of Nuclear Material Safety and Safeguards**

April 1989

Table 2.4. Estimated Radiological Inventory of the Different Waste Components[a]

| Source and Type of Material | Mass[b] (MT) | Inventory (Ci) Uranium-238 | Radium-226 | Thorium-232 | Thorium-230 | Radium-228 |
|---|---|---|---|---|---|---|
| Factory Site | | | | | | |
| Process equipment and contaminated material | - | - | - | - | - | - |
| Building rubble | 28,100 | - | <1.4 | 2.8 | 0.37 | 2.8 |
| Steel (structural and equipment) | 7,300 | - | <0.36 | 0.73 | 0.095 | 0.73 |
| Contaminated soil | 222,400[c] | 26 | 2.9 | 39 | 4.9 | 39 |
| Intermediate Site | | | | | | |
| Contaminated soil | 9,100[c] | 0.39 | 0.016 | 0.060 | 0.008 | 0.060 |
| Disposal Site | | | | | | |
| Ore tailings | 19,300[c] | 0.26 | 16 | 26 | 3.3 | 110 |
| Sludge pile | 3,400[c] | 0.79 | 4.4 | 2.7 | 0.34 | 3.0 |
| Sediments, pond 1 | 11,500[c] | 0.76 | 0.82 | 36 | 4.6 | 36 |
| Sediments, ponds 2, 3, 4, 5 | 5,500[c] | 0.47 | 0.07 | 1.2 | 0.15 | 1.2 |
| Neutralization and stabilization agents | - | - | - | - | - | - |
| Contaminated soil | 42,400[c] | 1.8 | 2.7 | 7.9 | 1.14 | 7.9 |

Table 2.4. Continued

| Source and Type of Material | Mass[b] (MT) | Inventory (Ci) Uranium-238 | Radium-226 | Thorium-232 | Thorium-230 | Radium-228 |
|---|---|---|---|---|---|---|
| **Miscellaneous** | | | | | | |
| Incinerator ash | 200 | - | <0.01 | 0.02 | 0.003 | 0.02 |
| Rare earth chemicals | 600 | - | <0.03 | 0.06 | 0.008 | 0.06 |
| Temporary detention pond sediments | 1,100[c] | - | - | - | | - |
| **Residential Areas** | | | | | | |
| Contaminated soil | 49,300 | - | - | - | - | - |
| **Reed-Keppler Park** | | | | | | |
| Contaminated soil | 18,400 | - | 0.52 | 5.2 | 0.61 | 5.2 |
| **Sanitary Treatment Plant** | | | | | | |
| Contaminated soil | 80,200 | 0.55 | 4.26 | 24 | 1.8 | 24 |
| 15% Contingency | 86,900 | 4.6 | 5.0 | 22 | 2.4 | 34 |
| Total | | 36 | 38 | 170 | 19 | 260 |

[a] Inventories are the product of the concentrations (see Table 2.3 and the mass in column 2); they are reported to two significant figures.

[b] Unless otherwise indicated, the mass is that given in Table 2.2.

[c] Value is a dry mass calculated from the volumes given in Table 2.2 and the dry densities of 1.59 g/cm$^3$ (contaminated soil), 1.03 g/cm$^3$ (ore tailings), 0.90 g/cm$^3$ sludge, and 0.56 g/cm$^3$ (pond sediments) (Kerr-McGee 1986--Vol. III, Table 3-1).